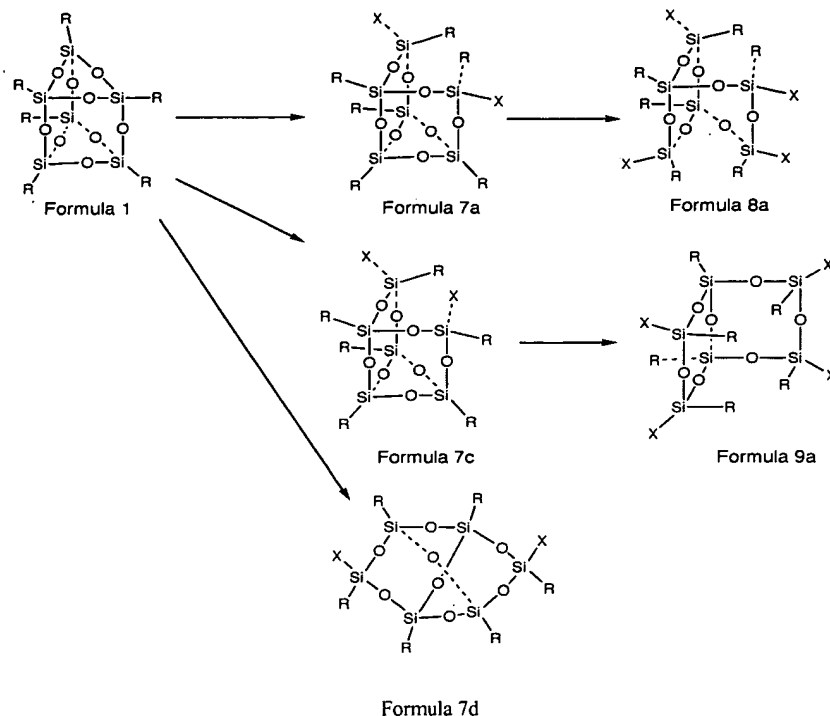


5. A method for selectively opening the rings in POSS compounds to form functionalized POSS derivatives comprising, reacting  $[(\text{RSiO}_{1.5})_n]_{\Sigma\#}$ ,  $[(\text{RSiO}_{1.5})_n(\text{R}^3\text{SiO}_{1.5})_m]_{\Sigma\#}$  or  $[(\text{RSiO}_{1.5})_n(\text{R}^1\text{R}^2\text{SiO}_{1.0})_m]_{\Sigma\#}$  with a strong acid to form said derivatives, having a conjugate base which base is F, OH, SH, NHR,  $\text{NR}_2$ ,  $\text{ClO}_4$ ,  $\text{SO}_3\text{CH}_3$ ,  $\text{SO}_3\text{CF}_3$ ,  $\text{SO}_3\text{OH}$ ,  $\text{SO}_3\text{Cl}$ ,  $\text{SO}_3\text{CH}_3$ ,  $\text{NO}_3$ ,  $\text{PO}_4$  or Cl, where n is 6-12, m is 1-10, where  $\text{R}^1$ ,  $\text{R}^2$  and  $\text{R}^3$  are different substituents than R which are all selected from the group consisting of aliphatic, aromatic, olefinic, alkoxy, siloxy and H and where # is the sum of the lettered substituents in said POSS compound.

10. The method of claim 5 wherein  $[(\text{RSiO}_{1.5})_n(\text{R}^3\text{SiO}_{1.5})_m]_{\Sigma\#}$  is reacted with said acid to form  $[(\text{RSiO}_{1.5})_6(\text{R}^3\text{XSiO}_{1.0})_1(\text{RXSiO}_{1.0})_1]_{\Sigma 8}$ , where  $\text{R}^3$  is of the same group as R but is a different substituent and # is  $m + n$ .

11. The method of claim 5 wherein  $[(\text{RSiO}_{1.5})_7(\text{R}^3\text{SiO}_{1.5})_1]_{\Sigma 8}$  is reacted with said acid to form  $[(\text{RSiO}_{1.5})_4(\text{RXSiO}_{1.0})_3]$  and  $\text{R}^3$  is of the same group as R but is a different substituent.

12. The method of claim 3 wherein the compound of formula 1 is reacted with said acid to form a compound selected from the formulas 7a, 8a, 7c, 9a or 7d as follows:



18. A polyhedral oligomeric silsesquioxane (POSS) compound of the formula,  $[(\text{RSiO}_{1.5})_n(\text{RXSiO}_{1.0})_m]_{\Sigma\#}$ , where  $n$  is 4-24,  $m$  is 1-10,  $R$  is aliphatic, aromatic, olefinic, alkoxy, siloxy or  $H$  and  $X$  is the conjugate base of an acid, which base is of  $F$ ,  $OH$ , when the  $OH$  groups are in an exo-stereochemical position,  $SH$ ,  $NHR$  or  $NR_2$ ,  $ClO_4$ ,  $SO_3OH$ ,  $SO_3CF_3$ ,  $SO_3Cl$ ,  $SO_3CH_3$ ,  $NO_3$ , or  $PO_4$ , when said compound has at least three open rings.

19. The POSS compound of claim 18 selected from the group consisting of  $[(\text{RSiO}_{1.5})_n(\text{RXSiO}_{1.0})_m]_{\Sigma\#}$ ,  $[(\text{RSiO}_{1.5})_n]_{\Sigma\#}$ ,  $[(\text{RSiO}_{1.5})_n(\text{R}^3\text{SiO}_{1.5})_m]_{\Sigma\#}$ , and  $[(\text{RSiO}_{1.5})_n(\text{R}^1\text{R}^2\text{SiO}_{1.0})_m]_{\Sigma\#}$ .

20. A method for expanding rings in polyhedral oligomeric silsesquioxane (POSS) compounds comprising, reacting  $[(\text{RSiO}_{1.5})_n(\text{R}(\text{HO})\text{SiO}_{1.0})_m]_{\Sigma\#}$  with  $Y_2\text{SiR}^1\text{R}^2$  silane reagents to obtain at least one expanded POSS ring in  $[(\text{RSiO}_{1.5})_{n+m}(\text{R}^1\text{R}^2\text{SiO}_{1.0})_i]_{\Sigma\#}$ , where  $R$ ,  $R^1$  and  $R^2$  are